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Nutritional and sensory properties of newly released rice varieties in northern Telangana region, India

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Abstract
The Nutritional properties of two newly released rice (*Oryza sativa*) varieties such as Anjana (JGL-11118) and Pradhyumna (JGL-17004) were determined. Moisture content of rice varieties Anjana and Pradhyumna was 7.85 ± 0.2 and 7.21 ± 0.12 percent. Ash content of Anjana and Pradhyumna was 0.53 ± 0.13 and 0.89 ± 0.02 percent. Ash content of rice variety Pradhyumna was higher than the ash content of rice variety Anjana. The protein content was 7.9 ± 0.0 and 7.53 ± 0.2 g/100 g respectively in Anjana and Pradhyumna. The fat content was 0.55 ± 0.08 and 0.59 ± 0.06 g/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Crude fibre content was 0.39 ± 0.10 and 0.24 ± 0.05 g/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Carbohydrate content of Anjana (JGL-11118) and Pradhyumna (JGL-17004) was 83.11 ± 0.62 and 83.7 ± 0.07. Dietary Guidelines recommend that consumers should eat more nutrient-dense choices, meaning foods that deliver ample vitamins and minerals with relatively low amounts of calories. Rice ((*Oryza sativa*)) is also dense in calories, providing 103- 108 calories per half-cup of cooked rice (Betrez- Marquez *et a1*., 2005). Energy values of the Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice were 369.45 ± 0.64 and 370.38 ± 0.62 kcal/100 g. Iron content of rice varieties Anjana (JGL-11118) and Pradhyumna (JGL-17004) was 0.93 ± 0.04 and 0.86 ± 0.04 mg/100 g. Calcium content of rice varieties Anjana (JGL-11118) and Pradhyumna (JGL-17004) was 9.3 ± 1.15 and 10.3 ± 0.5 mg/100 g. Sensory properties of rice variety Anjana (JGL-11118) had scored high in all sensory attributes compared to Pradhyumna (JGL-17004) rice variety. Colour is one of the most important attributes of raw and cooked rice, especially, the degree of whiteness (Suwansri *et al.,* 2002). Anjana (JGL-11118) rice variety recorded good scores for colour (4.13 ± 0.74), appearance (3.73 ± 0.59), flavor (3.73 ± 0.79), taste (3.86 ± 0.63), texture (3.8 ± 0.77) and overall acceptability (4.26 ± 0.45). The colour, appearance, flavor, taste, texture and overall acceptability for Pradhyumna (JGL-17004) rice variety were 2.6 ± 0.81, 3.133 ± 0.91, 3.06 ± 0.70, 3.33 ± 0.61, 2.93 ± 0.70, 3.4 ± 0.73 respectively.

Keywords: *Oryza sativa*, Sensory properties

Introduction
Rice, beyond its nutritive value has got high digestibility and the least allergenic property than all other grains so it can be enjoyed by young and old alike (Betrez-Marquez *et al*., 2005) [7].
Rice is the main constituent of life-saving oral rehydration solutions (ORS), and has been used for treatment of various ailments such as diarrhea, vomiting, fever, hemorrhage, chest pain, wounds, and burns. Recent studies recommend rice as a novel food due to its high mineral content, antioxidant properties and low glycemic index for lowering the incidence of lifestyle-related diseases such as heart attack, diabetes and cancer, which have begun to assume epidemic form over the last two decades not only in urban India, but in rural India too (Rhoades, 2008) [17]. Rice has a low-fat, low-cholesterol, low-salt contents. It makes a perfect diet for hypertension persons who have been advised salt-restricted diets. It has been noted by modern researchers that wherever-rice is used as the main food, there is a corresponding benefit of youthful vitality and a very low rate of hypertension. Calcium in brown rice, in particular, soothes and relaxes the nervous system and helps relieve the symptoms of high blood pressure (Ahuja *et al*., 2008) [2]. Cooking quality is very important for the acceptance of a variety by the consumers and is determined in terms of water uptake, volume expansion ratio, kernel length after cooking and elongation ratio. (Das *et al*., 2005) [9].
Hence, the present study was undertaken to Analyse the Nutritional and Sensory Properties of the selected newly released rice varieties of Northern Telangana region.

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Materials and methodology

Materials: One of the new released rice varieties viz Anjana (JGL-11118) and Pradhyumna (JGL-17004) were procured from Regional Agricultural Research Station, Jagityal, Karimnagar.

Experimental design: Proximate analysis was conducted for the two newly released rice varieties of Northern Telangana region. Moisture content of the samples was determined using the procedure given by Association of Official Analytical Chemists (AOAC, 2005) [6]. Protein content was estimated from the crude nitrogen content of the sample determined by the Micro Kjeldhal method (N × 6.25) (AOAC, 2005) [6]. Fat content was estimated as crude ether extract of the dry material using automatic Gerhardt Soxtherm extraction unit (AOAC, 2005) [6]. Crude fiber content of the samples was determined by the procedure of the Association of Official Analytical Chemists (AOAC, 2005) [6]. Total ash was determined using the procedure documented by Association of Official Analytical Chemists (AOAC, 2005) [6]. Energy and carbohydrate content was calculated by difference method (Gopalan *et al*., 2004) [13]. Calcium content of the samples were determined using Titrimetric method (Siong *et al*., 1989) [18]. Iron content of the samples were determined using α-α dipyridyl method respectively.

Organoleptic properties like cooking time, weight of cooked rice and loss of gruel were determined by standard procedure (AACC, 1995). Sensory evaluation of the samples was done using 5 point hedonic scale (5 – Very good to 1 – Poor) (Amerine *et al*., 1965) [4]. The two rice products viz Anjana (JGL-11118) and Pradhyumna (JGL-17004) were subjected to sensory evaluation by 15 semi-trained panel members (consisted of staff and graduate students of the Department of Foods & Nutrition) by using a sensory evaluation score card at the Department of Foods & Nutrition, Post Graduate & Research Centre, PJTSAU. Panellists were provided with water and instructed to rinse and swallow water between samples.

Statistical analysis

Mean and standard deviation for three parallel replicates were calculated. Analysis of variance (ANOVA) was used to test the difference between means. (Snedcor and Cochran, 1983) [19].

Results and discussion

The Nutritional properties of two newly released rice (*Oryza sativa*) varieties such as Anjana (JGL-11118) and Pradhyumna (JGL-17004) were determined. The content of nutrients like moisture, ash, protein, Fat, fibre, carbohydrates, energy, iron and calcium were assessed and the results are presented in Table 1

Moisture content of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties was 7.85 ± 0.2 and 7.21 ± 0.12. The moisture levels were within the acceptable limit (12%) for long term stored rice (Adair *et al.,* 1973) [1].

Ash content of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties was 0.53 ± 0.13 and 0.89 ± 0.02. The ash content of rice variety Pradhyumna was higher than the ash content of rice variety Anjana. Dipti *et al.* (2003) [11] reported that ash residual is generally taken to be a measure of the mineral content of materials. High ash content in milled rice is an indication of a good quality of minerals in the rice sample.

The protein content was 7.9 ± 0.0 and 7.53 ± 0.2 g/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Protein values of samples are within the acceptable limits. Protein content of rice can range from 6-15 percent (FAO, 1993). Protein plays an important role in cooked rice texture due to formation of a complex with starch that impairs the swelling of starch granule. Starch granule swelling affects both viscosity intensity and the rate of starch gelatinization. Protein content can vary with the degree of milling (Suwannaporn, 2007) [21].

The fat content was 0.55 ± 0.08 and 0.59 ± 0.06 g/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Okaka, (2005) [16] reported that higher fat content exposes the grains to spoilage during storage due to oxidation. Since the fat content of samples are within the acceptable limits, grain spoilage is less. Crude fibre of samples ranged from 0.39±0.10 and 0.24±0.05 g/100 g.

Carbohydrate content of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties was 83.11 ± 0.62 and 83.7 ± 0.07. Energy values of Anjana (JGL-11118) and Pradhyumna (JGL-17004) rice varieties were 369.45 ± 0.64 and 370.38 ± 0.62 kcal/100 g.

Iron content of rice varieties Anjana (JGL-11118) and Pradhyumna (JGL-17004) was 0.93 ± 0.04 and 0.86 ± 0.04 mg/100 g. These values are within the range 0.2 to 2.8 mg/100 g reported by (Kennedy *et al*., 1975) [14]. Calcium content was 9.3 ± 1.15 and 10.3 ± 0.5 mg/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Presence of Calcium in rice is a clear indication that when consumed, it will aid normal development and maintenance of bones and teeth, clotting of the blood, nerve irritability in the blood (Alaka and okaka 2011) [3]. If rice is taken as a staple food in large quantity compared to other foods, there will be sufficient contribution of minerals through diet.

Table 1: Nutritional properties of two newly released rice varieties grown in Northern Telangana region. (Per 100 g).

Variety Name	Accession No	Moisture (g)	Ash (g)	Protein (g)	Fat (g)	Fiber (g)	Carbohydrate (g)	Energy (k.cal)	Minerals	
									Iron(mg)	Calcium(mg)
Anjana	JGL-11118	7.85±0.22	0.53±0.13	7.9±0.0	0.55±0.08	0.39±0.10	83.11±0.15	369.45±0.6	0.93±0.04	10.3±0.57
Pradhyumna	JGL-17004	7.21±0.12	0.89±0.02	7.53±0.2	0.59±0.06	0.24±0.05	83.7±0.07	370.38±0.64	0.86±0.06	9.3±1.15

Note: Values are expressed as mean± Standard deviation of three determinations.

The Organoleptic-test was conducted for the appearance, cohesiveness and tenderness on touching, tenderness on chewing, taste, aroma, and overall acceptability of cooked rice and evaluated by trained panels. Sensory attributes like aroma, flavour, taste, tenderness or hardness, cohesiveness or stickiness, appearance, all influence the eating quality (Mundy *et al.,* 1989) [15]. Sensory evaluation of two rice varieties namely Anjana (JGL-11118) and Pradhyumna (JGL-17004) was done. 64 g of raw rice was taken for each rice variety and cooked with 1:2 ratio of water and subjected to sensory evaluation for their sensory attributes in the Foods Lab of the Department of Foods & Nutrition, Post Graduate & Research Centre, PJTSAU, Hyderabad. Sensory parameters assessed were colour, appearance, flavor, taste, texture and overall acceptability using 5 point hedonic scale (5 – very good to 1 – poor) (Amerine *et al*., 1965) [4]. The sensory

scores for colour, appearance, flavour, Texture, taste and overall acceptance are shown in Table.

Table 2: Sensory evaluation of two newly released rice varieties of Northern Telangana region.

Variety name	Accession No	Colour	Appearance	flavour	Taste	Texture	Overall
Anjana	JGL-11118	4.13±0.74	3.73±0.59	3.73±0.79	3.86±0.63	3.8±0.77	4.26±0.45
Pradhyumna	JGL-17004	2.6±0.81	3.13±0.91	3.06±0.70	3.33±0.61	2.93±0.70	3.4±0.73

Note: Values are expressed as mean± Standard deviation

From the results it was observed that rice variety Anjana (JGL-11118) has scored high in all sensory attributes compared to Pradhyumna (JGL-17004) rice variety. Colour is one of the most important attributes of raw and cooked rice, especially, the degree of whiteness (Suwansri *et al.,* 2002) [22]. Anjana (JGL-11118) rice variety recorded good scores for colour (4.13 ± 0.74), appearance (3.73 ± 0.59), flavor (3.73 ± 0.79), taste (3.86 ± 0.63), texture (3.8 ± 0.77) and overall acceptability (4.26 ± 0.45). The colour, appearance, flavor, taste, texture and overall acceptability for Pradhyumna (JGL-17004) rice variety were 2.6 ± 0.81, 3.133 ± 0.91, 3.06 ± 0.70, 3.33 ± 0.61, 2.93 ± 0.70, 3.4 ± 0.73 respectively. The amylose content affects the texture of rice more than physical characteristics such as gelatinization temperature and gel consistency. Rice with high amylose content are hard and dry in term of their texture compared with rice with lower amylose content (Dipti *et al.,* 2002) [10].
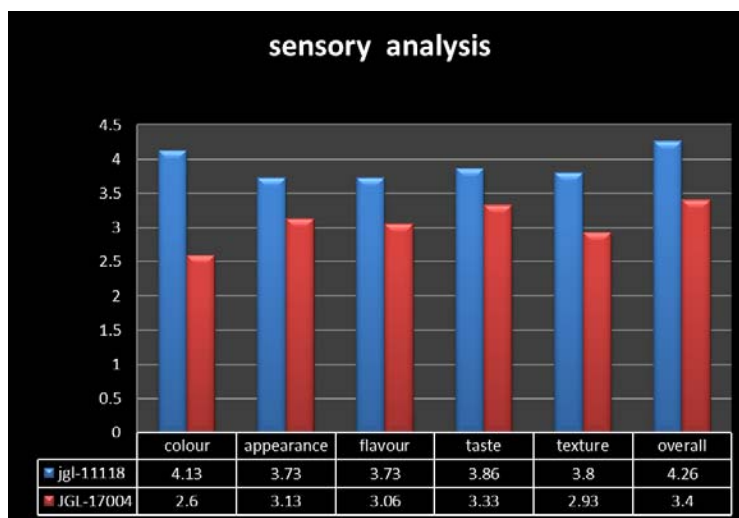

Fig 1: Sensory evaluation of two newly released rice varieties of Northern Telangana region

Srisawas and Vinod (2007) [20] examined the effects of water-to-rice ratios on sensory hardness, stickiness and fragrance. With increasing water-to- rice ratios, sensory hardness decreased and stickiness increased. Fragrance was not significantly affected by water-to-rice ratio.

Conclusion
Results of the study revealed that nutritional properties of Anjana and Pradhyumna rice variety Ash content was 0.53 ± 0.13 and 0.89 ± 0.02 percent. Ash content of rice variety Pradhyumna was higher than the ash content of rice variety Anjana. The protein content was 7.9 ± 0.0 and 7.53 ± 0.2 g/100 g respectively in Anjana and Pradhyumna. The fat content was 0.55 ± 0.08 and 0.59 ± 0.06 g/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Crude fibre content was 0.39±0.10 and 0.24 ± 0.05 g/100 g respectively in Anjana (JGL-11118) and Pradhyumna (JGL-17004). Carbohydrate content of Anjana (JGL-11118) and Pradhyumna (JGL-17004) was 83.11±0.62 and 83.7 ± 0.07. Organoleptic test revealed that the rice variety Anjana (JGL-11118) had scored high in all sensory attributes compared to Pradhyumna (JGL-17004) rice variety.

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